Winter 10-15-1996

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Abstract
Dragons are found throughout the history of most civilisations, yet we appear to know little about them. This paper will present a (tongue-in-cheek) introductory analysis of dragons and their place in society, suggesting that perhaps they are not necessarily the terrible and evil creatures they are sometimes portrayed to be . . .

Additional Keywords
dragons; hoards; leap years; treasure; virgins; wyverns
The Mechanics of Dragons: An Introduction to The Study of their 'Ologies

Angela Surtees and Steve Gardner

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By the philosophers I am named Mercurius; my spouse is the (philosophic) gold, I am the old dragon found everywhere on the globe of the Earth, father and mother, young and old, very strong and very weak, death and resurrection, visible and invisible, hard and soft; I descend into the Earth and ascend to the heavens, I am the highest and the lowest, the lightest and the heaviest; often the order of nature is reversed in me, as regards colour, number, weight and measure; I contain the light of nature; I am dark and light; I come forth from Heaven and Earth; I am known yet do not exist at all; by virtue of the sun's rays all colours shine in me, and all metals.

Thomas Charnock (c.1524)

We would like to begin by following that prologue with the title of our paper, "The Mechanics of Dragons: An Introduction to the Study of Their 'Ologies". We must say "introduction" because, as Thomas Charnock pointed out over 450 years ago, we cannot hope to uncover all the dragon's secrets. Their "ologies" is our short-hand way of covering alchemology, gemology and virginology. Our extensive research has uncovered many hitherto unrecorded facts detailing not only the different, more generally known, types of dragons, but also their social interactions and breeding habits. As may be expected, the only humans able to write with any authority on this subject were the mages and alchemists. Much of their work, by its very nature, was not written down but passed down through generations, garbled by the ignorant and left for the serious scholars to untangle. Let us begin our untangling with a look at the many and various types of this marvellous creature that man has sighted through the Ages.

Most people today seem to have an image in their minds of a ferocious creature with wings. However, the LUNG of the Chinese, the DRACON or DRAKOS of the Greeks, the DRACO of the Romans, the THANIN of the Hebrews, the DARKON of the Chaldees, the NAGA of the Sanskrit and the Egyptian dragon have no such limited signification. Indeed, we have found at least six main groupings for the supposedly mythical dragon. One myth about dragons we must first dispel. Dragons, like most dinosaurs, are not reptiles. They are a separate species descended from dinosaurs and have in fact retained the warm-blooded body of their dinosaur ancestors.

The most obvious to the European mind is the large, winged model with two large back legs, front legs, with a scaled skin and the ability to breath fire. These were generally the largest of the species and varied in total length from 10 - 15m. Above this size, flight probably becomes impossible and housing difficult to find. Smaug and Scatha were two examples of this type. Very occasionally a really ancient creature of high cunning can grow to 20m or even 30m long.

One such was the Dragon of Wantley. This wondrous beast was said to have "massive wings, a sting in its tail, long, long claws, 44 iron teeth, hide as tough as buff", and was partial to children, cattle and trees. It "smoked from the nose" and was over 90 feet long. This inoffensive creature was cruelly murdered by the knight More of Morehall, who, on the advice of a local witch, attached large iron spikes to the outside (being a smart chap!) of his armour. When the beast tried to squeeze him . . . ! This foul deed was recorded in 1699 and was said to be a recent event. This particular dragon was then very, very old. Maybe a little senile by then, to fall for such an old trick.

The next category is the large dragon, again with wings but without the ability to breath fire. One of the garbled tales mentioned earlier became a song referring to one of this type: Puff the Magic Dragon (Yerrow and Lipton, 1963) was popular a few years ago amongst children and those with an unsophisticated taste in music. These were generally between 6 and 12m long. There are many mentions of this type

1 The illustrations in this paper are by Ruth Lacon.
throughout history, and Aristotle, Herodotus and Cicero are not least amongst them. Pliny indeed talked of the “swarms of winged serpents about the Arabian marshes” (Gould et al, 1977, p. 27). Another is described thus:

The monster is described as the bulk of a horse or ox, with long neck and serpent’s head – tipped with mule’s ears – the mouth widely gaping and furnished with sharp teeth, eyes sparkling as though they flashed fire, four feet provided with claws like a bear, a tail like a crocodile, the whole body being coated with hard scales. It had two wings, blue above, but blood-coloured and yellow underneath; it was swifter than a horse, progressing partly by flight and partly by running.

(Gould et al, 1977, p. 41)

Recorded by Athanasius Kircher, being part of an account of the fight between a knight and a dragon on the island of Rhodes in 1349 AD.

The earliest reference we have come across was from the Shan Hai King or Mountain and Sea Classic (Gould et al, 1977, p. 71). This celebrated Chinese work is at least as old as the Chow dynasty as it is mentioned in contemporary manuscripts and is therefore pre- 1122 BC. It gives a description of the flying serpent of the Sien mountains. The words “drake” and “serpent” are often used in the classification of this particular type. The next variety are the true drakes of the dragon world. These are the wingless, fireless types often depicted as a snake-like creature. Eastern Mythology and art portray them as benign semi-deities. Western, Classical and Medieval dragons are portrayed differently so man has learned to fear them. They vary greatly in size and one of the largest recorded was Tolkien’s Glaurung. In most mythologies these dragons possess and can confer immortality. More about the powers of dragons later.

There are smaller, younger dragons in this category that range from 1 – 4m. These were reputed to have guarded the olive trees in Greek mythology. The wyvern is another variation of this particular type, the difference being that the wyvern has no front legs.

Sea drakes had many features in common with their land-based cousins but a few major differences. Their front legs and their strong back legs developed into flippers and their tails became more muscular. They were wingless and, by necessity, fireless too. They were coastal by habit as they bred on land and were generally between 5 – 10m long. Several sightings have been made of much larger creatures though; notably by the captain of the H.M.S. Daedalus in 1847 who “watched a sea serpent more than sixty feet long for a full twenty minutes” (Cox and Attenborough, 1975, p. 31). At this late date in history he was derided for his report, but tales of sea monsters go back to the very earliest seafaring days.

There are a few mentions of small land dragons that could breathe fire, but these are very early sightings and we believe them to be the rare encounters with young dragons. This brings us neatly onto breeding. No, not virgins.

Reproduction. In order to set the scene for the rare and dramatic coming together of sexually mature dragons, we will describe their physical and social surroundings and customs for your better understanding.

Dragons are territorial and isolationist. Their lairs are well away from built-up areas and the borders are carefully noted by other dragons. The older, more sophisticated ones will live near enough to landed gentry or royalty to periodically raid their dwellings for well-covered meals – cooks are particularly delectable – and to relieve men of the contents of their treasuries and armouries. Between raids sheep provide a
tasty meal and most dragons enjoy the occasional horse or goat. Also, stoats are a favourite snack amongst Western dragons.

The treasure is taken back to their lair which, wherever possible, is to be found in dry caves with plenty of airy tunnels leading to and from the main cavern. It is in this main hall that dragons of both sexes deposit their treasure.

Wiglaf hastened into the earth-cavern, still wearing his corselet, his woven coat of mail. After the fierce warrior, flushed with victory, had walked past a dais, he came upon the hoard — a hillock of precious stones and gold treasure on the ground. He saw wondrous wall-hangings; the lair of the serpent, the aged twilight flyer; and the stoups and vessels of a people long dead, now lacking a polisher, deprived of adornments. There were many old, rusty helmets, and many an armlet cunningly wrought. A treasure hoard, gold in the ground, will survive its owner easily, whosoever hides it!

(Crossley-Holland, 1987)

All pieces are mentally catalogued and current market values are always worked out. A dragon will always know the exact contents of his hoard. The bigger the dragon’s hoard the more powerful he is. We know that size is not everything, but in the case of the ritual nesting of mature dragons — it sure is! Periodically the dragons that live on the borders of the most powerful dragon’s domain will be invited to inspect the hoard. The sex of the most powerful and feared dragon is irrelevant. The owner of the richest nest of treasure will have first choice of suitors to begin the highly ritualistic and long courtship that will lead to the consummation in several month’s time. “Come and see my chalices . . .” was a possible chat-up line.

The value of the hoard was mathematically correspondent to the size of the area over which the dragon had dominion. So, more treasure, more land, more choice of mate. If there was any discrepancy over the size and value of two hoards, then the rarely required code of practice would dictate the rules for engagement. Very occasionally would there be physical battle. The weaving of spells and the casting of riddles would usually establish a winner.

The female is very demanding of her prospective mate and things must be correct. He must bring gifts of food and minor treasures to her lair. It was often the case that the older, larger dragons were female as their treasures were increased by the mating rituals. The ones that men saw and encountered on raids were often marauding males looking for gifts for his mate, rather than give her something from his own hoard. Few things are so devastating to a dragon than to lose something from his hoard! When the female, or dragoness, is suitable courted and ready for the consummation of the temporary relationship she will indicate by rearing to meet the male. They mate eye to eye, belly to belly, showing complete trust by so exposing themselves.

The role of the male is then completely over and rarely will he see his young. Six weeks after fertilisation the dragoness lays her single egg into the carefully laid out treasure. The embryotic fluid in the egg has the ability to retain heat and when the mother has to leave the lair to feed she buries the egg deep into the metals in the costly nest and warms them before she leaves.

The dragonet emerges from the egg a year and a day from the deposition. Over the next few months the mother will instruct junior in the rules for hunting and will find him a cave, not too near. She will allow him into her territory to hunt for a while, but will take the better pieces of any treasure acquired as payment. Once the dragonet is completely established in its own domain, however small, the mother is free to mate again.

Now that we have captured your interest by talking about sex, let us continue with a description of the physical and biological assets that enable dragons to be so unique in the animal world. We will concentrate on the largest species — the winged, fire-breathing dragons — and give a brief outline of their anatomical uniqueness. The wings would appear to be unable to support the weight of the fully grown creature. This is probably true. But it is worth pointing out that two fossils of flying dinosaurs have been found in the United States, the wingspans of which are nearly 50 feet (15 meters)! So the wings on their own were probably not capable of supporting the total weight in flight. What else was it about dragons that enabled some of them to fly? Firstly the bone-structure; the bones were not only hollow but built up of honey-combed blocks that are extremely light. Secondly the stomach is actually three chambers, similar to
Bovines. One is for digestion of food, one is for the production of special gases and the other is a storage chamber in which these gases are kept until needed. These hot gases are mainly by-products and variations on hydrogen- and sulphur-based compounds; such as Hydrogen Sulphide, Sulphur Dioxide, Sulphuric Acid, etc., and assist in both lift and fire. These gases are both the fuel for dragons' flames and the hidden element in their ability to fly. The wings are necessary for propulsion and manoeuvring — and fire served several purposes.

As one, dragons swivelled their wedge-shaped heads to their riders for firestone. Great jaws macerated the hunks. The fragments were swallowed and more firestone was demanded. Inside the beasts, acids churned and the poisonous phosphines were readied. When the dragons belched forth gas, it would ignite in the air into ravening flame to sear the Threads from the sky.

(McCaffrey, 1970, pp. 177-178)

Any excess of gas could be used as a weapon during hunting or marauding. It was used during mating displays as a sign of strength. It was a useful way of dissuading the curious from cave entrances and was the ultimate mode of self-defence when challenged. The gases were ignited by a spark created in the back of the throat. Two small, but very tough muscles vibrated at great speed and produced a tiny electrical spark across the narrow gap. When the noxious gases were expelled, from the chamber within, a sheet of flame rushed from the dragon’s mouth. When flame was not required the muscles contracted back into the sides of the throat and the only exhalation was the particularly revolting and distinctly sulphurous dragon’s breath. Noxious products are sometimes named after this, for example Woodspring Smial’s magazine and the condiment we showed at the presentation!

We cannot begin to cover the evolutionary growth of the dragons in this short time, but as a brief outline we can tell you this. The wings of the first drakes and dragons may have formed from the sail or fin of dinosaurs. Species such as Pelycosaurs refined and specialised their spinal sail into two parts. These developed into wings from the knuckle joint on the spine. There are indeed flying lizards alive today. Draco Volans ("flying dragon") has folds of skin supported by elongated ribs enabling it to glide between trees. There is a persisting legend about dragon blood, that it has mysterious properties. According to alchemists it contains a catalyst called "draconine" that makes the blood a deep purple colour, unique to dragons and other members of Royalty. It is also, apparently, very acidic like nitric acid. We only have the name for the catalyst but the alchemists of yore knew a way of extracting it from the blood and using the rest to create medicines and ingredients for expensive spells. Another lost art.
THE MECHANICS OF DRAGONS

From the vast amount of recorded material on the encounters with dragons in the past we have been able to make a list of the most common features that classify a dragon. They are very sharp-sighted. Their breath is poisonous. They are partial to virgins. They hoard gold. Land drakes dislike water. Water drakes dislike fire. They have dark, flat, hypnotic eyes. They have approximately 44 teeth. They are especially fond of milk. They have a strange stone (much sought after) in their forehead. They have wonderful scales.

These scales provide convincing camouflage as they often have the ability to blend into the surroundings. They are constructed in two layers. There is a translucent membrane over a metallic looking layer of flexible yet strong skin. As a dragon ages the scales become harder and very difficult to pierce. Young dragons are far more vulnerable to both accidents and attempted murder than their older counterparts. Those dragons that live in deep caverns have large ears because they have sonar capability. This is very necessary in deep, dark tunnels and caves. The ears can rotate to provide directional hearing, dragon hearing is very acute (ask Bilbo!). They also have an infrared capability which makes them formidable opposition underground.

The draconite is one of the rarest things on Earth. It is the precious “stone” that grows large in the forehead of the older, wilier, most “street-wise” dragons. It took many centuries to become fully mature and grew to become very beautiful. It was created by the dragoness marking her young, soon after birth, on the forehead with her sharp claw. This graze wept a waxy secretion that hardened and expanded the opening. As the dragon grew the draconite would grow new layers. As each layer solidified it created fascinating colours, edges and depths; so the beauty of the stone grew. It was said that there were as many colours of draconite as there are stars in the sky and it would appear to change colour within itself as the mood of the dragon changed. We believe it is likely that the “heart of the mountain” – the Arkenstone – was the draconite of one of Smaug’s ancestors. The draconite was the centre of a dragon’s soul and magic. A dragon’s magic is the most wonderful thing that sets it apart from all other creatures, and we have selected a few examples and stories to illustrate this. A dragon’s powers are both subtle and invidious. They can hypnotise and persuade with their voice, posture and eyes. The power comes from a strong psychic force that all dragons are born with, and the development of this is their highest goal.

The majority of dragons appreciate an adversary of some worth and a battle of wills is honour-bound by strict rules. It has been known for a hero or foe of high luck, or cunning, to sometimes get the better of a young or inexperienced dragon. Not often though. Bilbo was very different from any foe that Smaug had encountered before and much luck was with him, for as Tolkien says, “No dragon can resist the fascination of riddling talk” (Tolkien, 1966, p. 205). This enlarged sense of honour that makes a dragon stick to the rules can also mean that they can carry a grudge for many, many years. Some inherently wicked creatures take this to extremes. Glaurung, for example, had a thing against the children of Húrin. His bewitching of Túrin and Nienor is a case in point and his conversations with Túrin say much about the finely-honed quality of his malice.

Many legends from many cultures have observed the power that a dragon can display with its magnetic eyes “. . . [Ged] almost stared into the dragon’s eyes and was caught, for one cannot look into a dragon’s eyes” (from Ursula Le Guin’s A Wizard of Earthsea, 1971, p. 103).

A dragon’s blood and teeth are also said to have extraordinary powers. It has been claimed that an unnamed substance in dragon’s blood is the missing ingredient in the lost art of turning base metals into gold. Is this the “draconine” we mentioned earlier?

The draconite (the precious “stone” in the dragon’s forehead) has also been much desired in this context as well. Obtaining all these was a very risky business. Another was attempting veterinary dentistry around dragons. The Greeks had a legend that when being routed if you planted dragon’s teeth an army of immortal warriors would spring up in your defence. We have little proof of this one!

Because the various parts of the dragon’s body were so rare and precious, on the rare occasion when a dead dragon or skeleton was found it was completely stripped clean by interested parties. There is no part of a dragon that did not have a use for somebody. A chair or throne of dragon’s
bones was beyond price — see Tad Williams (1988).

The staking of a live dragon was a task beyond most farmers but there is a basic analogy that the staking of a dragon was akin to staking the earth. Indeed in *The Lost Language of Symbolism* Harold Bayley (1912) says that “George”, the most famous of all dragon slayers, could have lived up to the meaning of his name; “ge” meaning the earth and “urge” to encourage or stimulate the soil. It is not coincidence that St. George’s Day, April 23rd, is the time of planting and fertilisation after the end of winter. Many of the tasks required for the planting of seeds and roots are redolent of “staking the dragon”. The May Day celebrations to encourage growth and fertility are rooted in our deep past and even today symbolic dragons are used in many parts of the world to remind us of the immortality of both the dragon and of the seasons.

The consumption of a dragon’s heart was guaranteed to confer immense bravery and prowess in war. The eyes were coveted by the alchemists and the local healers for being a vital ingredient in the production of a narcotic medicine used in the relief of pain. Such a medicine was beyond price in violent times and enriched its creators in man’s eternal wars and battles. As well as the magic obtained from the dragon’s physical form there are the more subtle powers that no other animal enjoys. At least not to any great extent; mankind has some limited mental skills but these pale into insignificance compared to the average drake’s. One of a dragon’s greatest abilities is the way in which he collects and collates information. The most obvious way is through hypnosis. Often information on the state of a nation, or neighbourhood, could be extracted from a passing minstrel or knight by straightforward mesmerisation.

On a more local level farmers would be persuaded (i.e. “You tell me what is going on or I will fry your barn, and how old is your daughter now?”), to be forthcoming about the others in their community. The underlying feeling about the basic information given would be picked up psychically, though. There was also a network of semi-minions such as crows and reptiles that the dragon could mentally extract emotions from. If a newcomer entered a dragon’s territory, he could tell from the reactions of the other creatures whether the stranger was to be feared, ignored or investigated. A dragon always knows what is going on.

Another major asset to a dragon’s vast repertoire is his Earth Knowledge. Using senses that other creatures do not understand, dragons use ley-lines extensively. The energy given off by these lines of power aid a dragon in flight, very much like thermal air currents. Very often the boundaries of a dragon’s domain were along ley-lines and were as obvious as signposts to other dragons. Indeed, many of the major sightings of dragons in flight were made on known ley-lines and particularly on nodes where ley-lines meet: the dragons of Glastonbury Tor are a classic example.

There have been sightings of dragons all over the world and although characteristics vary, the similarities are enormous. Tales of knights, virgin daughters and treasure come from cultures and countries as varied as the Gauls, the Incas, the Chinese and the Tanzanians. The Bible mentions dragons several times. Isaiah Ch.13 v.22 says: “And the wild beasts of the islands shall cry in their desolate houses and dragons in their pleasant palaces.” In the Book of Revelations dragons and serpents are mentioned many times. The halls of long-dead kings were a favourite amongst Middle Eastern dragons, if they were high on a mountain, as sea level was far too hot for them. It is interesting to note that very few sightings of dragons have been made near the equator, too hot for dragons.

One of the most interesting tales for those at the Conference in Oxford is that a dragon was encountered locally in 1349 AD. This particular beast was unusual in that it was said to have two heads. Probably a bit of medieval exaggeration there. In Uffington, again not far from Oxford, was the unfortunate beast who had the bad luck to come across one of the St. Georges. In fact, if you look at the famous “Uffington Horse” chalk carving upside down it looks more like a dragon in flight than a horse.

The times, places, virgins and races that surround St. George vary considerably. One version involves our “hero” rescuing a princess from the monster (yawn) who is about to . . . devour her. Another tale relates how the dragon is standing guard over a spring and the country is in drought. St. George restores life to the land by extinguishing the bad dragon. There are so many Celtic and Slavonic fables along similar lines that one cannot blame the Christians for wanting one of their own.

Mind you, they did not stop at St. George. St. Romain of
Rouei killed “La Gargouille” which apparently went about ravaging and pillaging in the Middle Ages Seine region. St. Keyne of Cornwall gained renown by taking three days to kill his victim. Even the women got in on the action: St. Martha killed a terrible monster called “Tarasque” at Aix-la-Chapelle.

In the United Kingdom alone there have been over 70 written instances of dragons recorded for posterity. Add to this the considerable accounts in other parts of the world and the various depictions on coats-of-arms and crests, place names, pub names, etc., and you must seriously question the “mythical” nature of this wondrous animal.

One of the areas of “dragonology” that has not been investigated in any detail previously is the vexed question of the dragons’ intent with regard to virgins, be they princesses or milkmaids. Unfortunately we do not have time to study this now, but we will tell you about an interesting effect dragons have had on our lives, associated with virgins: Leap Year. Every four years neighbouring dragons would meet on 1st March to check each other out and establish and confirm treasure hoards and thus pecking order within dragon society.

Dragons called it “Leet Year” in our tongue. This is an Old English word with two appropriate meaning – as we know, dragons loved puns and double meanings. It means a “meeting of the ways” and “counting”, appropriate because the dragons would meet each other, do an elaborate dance in greeting and then check each other’s hoards out.

Man misheard or misinterpreted this to be “Leap Year”.

“Leap” is a Middle English word meaning “a male animal copulating with a female animal”. This confirmed man’s interpretation of the meeting, as man could not tell the sexes of dragons apart easily. Therefore when two dragons met, did what looked like a courtship display and then disappeared into a cave together, man assumed they were breeding.

After any extensive activity dragons would love to feed, or drink their favourite food – milk. Man would see the dragons fly towards the farms and villages and chase and eat the cows, and milkmaids often got eaten as well.

This meant that whenever the 1st March of every fourth year came round it was recorded that dragons came hunting maids. So no young woman wanted to be known as a maid on that day. That is why on the day before, 29th February, any free woman would ask a man to marry her. And we still continue this ritual in modern times. It is no more possible to find the definitive dragon than it would be to frame a cloud formation. Dissect a flower and the beauty and magic of it are lost, but do what you will the beauty and magic of the dragon remain safe.

Thank you.

References
The Holy Bible (King James Version). 1611.